REMARKS

In the Final Office Action, claims 58-73 were examined and rejected. Applicants hereby amend claims 65 and 72. In view of the foregoing amendments and the following remarks, Applicants respectfully request reconsideration of the application.

Rejection under 35 U.S.C. § 102(e)

In paragraph 4 of the Office Action, the Examiner rejected claims 58-66 and 71-73 under 35 U.S.C. § 102(e) as being anticipated by Williams (non-patent literature). By this communication, Applicants amend claims 65 and 72, and respectfully request reconsideration of the pending claims in view of the amendments and remarks set forth below.

At paragraph 2 of the Final Office Action, in apparent regard to claim 58, the Examiner stated, "Williams teaches texture operations being determined by a geometric shape of a projection of a pixel on a texture (pages 1-3) when he discloses the projection of a flat source image onto a curved surface." The Examiner further stated in paragraph 4:

> Williams discloses a method for mapping a texture onto a surface...comprising the steps of approximating a true pixel color by performing a number of texturing operations, texture operations being determined by a geometric shape of a projection of a pixel on the texture (pages 1-3); and averaging results of texturing operations (page 2; fig. 1). In other words, Williams teaches texture mappings of images onto surfaces to increase the realism and information content of computer-generated imagery. For example, he teaches the projection of a flat surface image onto a curved surface. The image is separated into its red, green, and blue component...As for averaging results of texturing operation [sic], Williams teaches each of the images is averaged down from its larger predecessor.

Applicants submit that the foregoing reasons for anticipation have no basis in the text or teachings of Williams. A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference. *Verdegaal Bros. v. Union Oil Co. of California*, 814 F.2d 628, 631, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987,

emphasis added). "The identical invention must be shown in as complete detail as is contained in the...claim." *Richardson v. Suzuki Motor Co.*, 868 F.2d 1226, 1236, 9 USPQ2d 1913, 1920 (Fed. Cir. 1989).

Applicants respectfully submit that in making this rejection, the Examiner confused a ***surface*** with a ***texture.*** As with others skilled in the art of 3D computer graphics, Williams treats a texture as distinct from a surface, stating, "the mapping of texture onto surfaces is an excellent example" of the use of mip maps (Abstract, page 1), "downsampling of the original texture...is illustrated...on a variety of surfaces" (page 3), "the area of the surface over which the illumination function is integrated...is analogous to area-averaging of...texture" (page 7), "bandlimiting texture...for mapping onto a surface" is one use of pyramidal parametrics (page 9), and "pyramidal parametrics provide...solutions to filtering problems in mapping texture and illumination onto surfaces" (page 10).

Clearly, Williams regards texture and surface as two distinct domains within image processing. Therefore, there is no logical basis for the assertion of the Examiner that "Williams teaches texture operations being determined by a geometric shape of a projection of a pixel on the texture...when he discloses the projection of a flat surface image onto a curved surface."

Williams does not disclose how a pixel is mapped to a texture, and does not disclose "a geometric shape of a projection of a pixel on the texture" as in claim 58. Rather, Williams states, "the partials of U and V (the ***texture map coordinates***) with respect to X and Y (the screen [***pixel***] coordinates) ***can be calculated from the surface projection***" (page 3, emphasis added). Discussing Figure 15 on page 7, Williams states, "the area of a ***surface represented by a pixel*** has been ***projected onto a curved surface***" (emphasis added). There is no explicit or implicit teaching in Williams that describes the projection of a pixel on a texture, much less a geometric

shape of that projection. The discussion of Williams is isolated to projecting a pixel onto a surface, not onto a texture. Therefore, Williams does not disclose "a geometric shape of a projection of a pixel on the texture" as in claim 58.

Consequently, there is no basis for the assertion of the Examiner that Williams teaches texture operations "being ***determined by*** a geometric shape of a projection of a pixel on the texture." Since Williams does not teach a geometric shape of a projection of a pixel on the texture, it logically cannot disclose "texturing operations being determined by a geometric shape of a projection of a pixel on the texture" as in claim 58.

Furthermore, Williams does not disclose "performing a number of texturing operations" as the Examiner stated. While Williams does disclose texturing and illumination as operations to be performed in computing pixel values, and intra- and inter-level interpolation of texture values, Williams does not disclose "performing a number of texturing operations" as in claim 58. Rather, the method of Williams provides mip maps as a means for filtering and data compression of only a ***single*** original texture. Williams discloses a single texture, stating (emphasis added),

> Mip mapping supplements bilinear interpolation of pixel values in ***the*** texture map (which may be used to smoothly translate and magnify ***the*** texture)...filtering of ***the*** original texture takes place when the mip map is first created (page 2). [U]psampling and downsampling of ***the*** original texture is illustrated...***the*** texture collapses to a line (page 3). [T]he R-G-B of ***a texture*** or illumination map (page 9)... Pyramidal parametrics provide...solutions to filtering problems in mapping ***texture*** and illumination onto surfaces (page 10).

Williams discloses mipmap memory structures as a convenient methodology for filtering and data compression of a single texture, but does not disclose performing a number of texturing operations and averaging results of a number of texturing operations as in claim 58.

In summary with regard to claim 58, this independent claim is not anticipated because each and every element as set forth in the claim is not found, either expressly or inherently

described, in Williams. Williams does not disclose performing a number of texturing operations being determined by a geometric shape of a projection of a pixel on the texture, and averaging results of texturing operations. Because claim 58 includes limitations not disclosed by Williams, Applicants submit that claim 58 is not anticipated.

Because claims 59-64 depend directly or indirectly from claim 58, Applicants submit that claims 59-64 are allowable for at least the same reasons as claim 58.

With regard to claims 65 and 72, the Examiner stated on page 5, lines 1-5, that "Williams teaches modifying a specularly reflected light intensity on a surface...(page 7, 3rd paragraph; figs. 13-14), comprising combining the specularly reflected light intensity with a specular reflectance coefficient...being retrieved from a specular reflectance coefficient ***map associated with the surface*** (pages 7-8)" (emphasis added). In paragraph 2, the Examiner elaborated by stating, "Williams teaches the shading function in Hanrahan mathematical expression depends on the shape of the surface, its light reflection properties, and the position of the light source." Applicants note that claims 65 and 72 are amended to state, "...said specular reflectance coefficient being retrieved from a specular reflectance coefficient map associated with a texture map." This amendment is supported in the specification at page 19, lines 13 and 20.

Williams does not teach all elements of amended claims 65 and 72, and particularly does not teach a specular reflectance coefficient retrieved from a specular reflectance coefficient map associated with ***a texture map***. Williams discloses that an illumination function that point-samples a ***surface*** generates illumination aliasing, then discloses modifying the projected area of a local curvature of the ***surface*** over which the illumination function is integrated (page 7, paragraph 6, lines 1-8; and Fig. 15). Williams then discloses "an illumination map...used to cast

reflections onto specular ***surfaces"*** by using a "pyramidal parametric illumination map [in which the] value 'D' used to index the map is proportional to the solid angle subtended by the ***surface*** over the pixel being computed" (page 8, emphasis added). However, a surface is not a texture, as shown above with respect to claim 58. Thus, Williams does not teach "...said specular reflectance coefficient being retrieved from a specular reflectance coefficient map associated with ***a texture map***," as required by amended claim 65.

Because Williams does not anticipate amended claim 65, Applicants request that claim 65 be allowed. Further, because claim 66 depends from claim 65, claim 66 is allowable for at least the same reasons as claim 65. Similarly, claim 72 includes the same limitation as claim 65, namely, "said specular reflectance coefficient being retrieved from a specular reflectance coefficient map associated with a texture map", so claim 72 should be allowed for the same reasons advanced above with respect to claim 65.

With regard to claim 71, the Examiner stated at page 5, second paragraph, "the limitations of claim 71 are identical to claim 58 above except for an electronically-readable medium storing a program for permitting a computer to perform. Therefore, claim 71 is treated the same as discussed with respect to claim 58 above." Applicants note that Williams does not disclose all the limitations of claim 58, as shown above, and therefore claim 71 should be allowed. Furthermore, claim 71 adds the limitation, "each of said texturing operations including accessing a mipmap at least one time in a marching direction corresponding to the geometric shape of the projection of the pixel on the texture." Williams clearly does not include the limitation "accessing a mipmap at least one time in a marching direction." Based on at least the above remarks in conjunction with claim 58, the Applicants emphasize that Williams does not

anticipate claim 71. Applicants respectfully request that the rejection to claim 71 be withdrawn and claim 71 be allowed.

With respect to claim 73, on page 5, paragraph 3, the Examiner stated that Williams teaches (emphasis added):

> an electronically-readable medium storing a program for permitting a computer to perform a method for adding detail to a texture map comprising at least one texture element, the method comprising ***generating a detail map*** (page 9), ***assigning a pointer*** (page 2; index correspond to pointer) ***into said detail map*** to at least one of the texture elements of the texture map to ***generate a pointer map***, [said] ***pointer comprising two offsets*** including ***a first offset stored in a first offset map and a second offset stored in a second offset map*** (pages 2-3); interpolating detail color ***based on the generated detail map*** (page 3); interpolating texture color based on the texture map; and ***combining detail color with texture color to generate a pixel color*** (pages 3 and 7-8).

Applicants submit that the foregoing italicized reasons for anticipation have no basis in the text or teachings of Williams. Applicants respectfully submit that Williams does not disclose generating a detail map, assigning a pointer into said detail map, generating a pointer map comprising two offsets, first and second offset maps, interpolating detail color based on the detail map, and combining detail color with texture color to generate a pixel color.

First, Williams does not disclose generating a detail map, in contrast to the assertion of the Examiner. Rather, Williams discloses "a pyramidal parametric data structure the components of which are spatial coordinates (the X-Y-Z of the vertices of a rectangular mesh...[to provide] a continuously-variable filtered instance of ***the surface*** for sampling at any desired degree of resolution" (page 9, emphasis added). Williams uses the pyramidal parametric data structure of spatial coordinates to "limit the level of detail with which ***the surface*** itself is represented" (Id.). Williams does not disclose a detail map, but merely affords a method for bandlimiting surface details.

In contrast to Williams, the detail map methodology of the instant invention as set out in the specification at section 9, pages 21-23 and figures 9-11 provides an innovative method for storing a "pattern collection" from which the magnified texture can be constructed by only translations. Irregular textures can be magnified without causing a coarse staircase structure on the screen. Thus, the detail map method innovation of the invention of claim 73 is completely different than the mechanism disclosed in Williams page 9 for bandlimiting surface detail.

Further, Williams does not disclose "assigning a pointer into said detail map to at least one of the texture elements of the texture map to generate a pointer map." On page 2, in the caption associated with the lower figure, Williams discloses, "D is the variable used to index, and interpolate between, the ***different levels*** of the pyramid" (emphasis added). The index D is used to index and interpolate ***between levels***, however, D is not a pointer assigned to at least one of the texture elements of the texture map. Williams does not disclose that the index D could point to a single texture element, or that D could point to even multiple individual elements—Williams only discloses that D can index between levels. In contrast, FIG. 11(a) of the present invention illustrates pointers assigned to discrete texture elements (i.e., texels) in one embodiment of the Applicants' invention.

Clearly, Williams does not disclose "generat[ing] a pointer map...comprising two offsets including a first offset stored in a first offset map and a second offset stored in a second offset map." As detailed above, D indexes between levels in the maps, but does not generate first and second offset maps. No other text or teaching in Williams even hints at describing first and second offset maps.

Since Williams does not disclose generating a detail map, there is no logical basis for the claim of the Examiner that Williams discloses "interpolating detail color based on the generated

detail map." The Applicants respectfully refer to the specification, pages 19-21, and figures 9-11, which shows that the inventive elements of claim 73 are completely and patentably distinct from the teaching of Williams.

Finally, Williams does not disclose "combining detail color with texture color to generate a pixel color." The Applicants have struggled to understand how Williams might disclose or even suggest this limitation. The discussion in Williams on page 3 describes the mechanism for implementing mip maps. Pages 7 and 8 describe highlight antialiasing, which describes neither texture color nor detail color. In no other text or teaching of Williams is there any disclosure of "combining detail color with texture color to generate a pixel color."

In summary with respect to claim 73, Williams does not disclose generating a detail map, assigning a pointer into said detail map, generating a pointer map comprising two offsets, first and second offset maps, interpolating detail color based on the detail map, and combining detail color with texture color to generate a pixel color. Based on at least the above remarks, Applicants respectfully submit that claim 73 is not anticipated by Williams and request that claim 73 be allowed.

Rejection under 35 U.S.C. § 103(a)

In paragraph 6, the Examiner rejected claims 67-70 under 35 U.S.C. 103(a) as being unpatentable over Williams in view of Cosman (U.S. Patent No. 5,651,104). Applicants respectfully traverse.

With regard to claim 67, the Examiner stated, page 6, paragraph 2, that Williams teaches (emphasis added):

> a texturing unit for mapping a texture to a surface...which texture comprises a mipmap, which mipmap comprises a plurality of levels, each of which levels comprises at least one texel (pages 1-3), the texturing unit comprising a control unit for ***receiving an input***

signal and determining a set of N footprint texel locations and at least one footprint level of detail from the input signal, which ***input signal includes information about a*** location and a ***shape of a projection of a pixel on the texture*** (pages 8-9—levels of detail in ***surface representation*** and dividing ***the surface*** up into regions of relatively low curvature of Williams discloses this limitation); an interpolator...and an averaging unit.

The Examiner went on to state that Cosman provided the RAM and output port of claim 67, and that it would have been obvious to combine a RAM and output port "to the system of Williams because it would have enable [sic] an image generator to store texture information in a RAM and output the information in a display unit."

Applicants assert that the Examiner has not established prima facie obviousness because not all claim limitations are taught or suggested by these references. The question under 35 U.S.C. 103 is...whether the claimed invention as a whole would [be] obvious. *Stratoflex, Inc. v. Aeroquip Corp.*, 713 F.2d 1530, 218 USPQ 871 (Fed. Cir. 1983). To establish prima facie obviousness of a claimed invention, all the claim limitations must be taught or suggested by the prior art. *In re Royka*, 490 F.2d 981, 180 USPQ 580 (CCPA 1974). "All words in a claim must be considered in judging the patentability of that claim against the prior art." *In re Wilson*, 424 F.2d 1382, 1385, 165 USPQ 494, 496 (CCPA 1970).

As noted above with respect to claim 58, Williams does not disclose or suggest the shape of a projection of a pixel on the texture. Williams only discloses the shape of a projection of a pixel on a ***surface***. As noted above with respect to claim 58, a texture is not a surface, therefore there is no basis for the assertion of the Examiner that "levels of detail in surface representation and dividing the surface up into regions of relatively low curvature of Williams discloses" the limitation of a shape of a projection of a pixel on the texture.

Further, neither Williams or Cosman or the combination thereof teaches or suggests the limitation "a control unit for receiving an input signal...which input signal includes information

about a...shape of a projection of a pixel on the texture" as in claim 67. Because Williams does not discuss the projection of a pixel on a texture, Williams cannot logically suggest receiving an input signal including such information.

As well, Cosman does not disclose or suggest an input signal including information about a shape of a projection of a pixel on the texture. In relevant part, Cosman states (emphasis added),

> The footprint calculation unit performs the operations...which includes ***calculating*** the ***projected pixel size***...[and] aspect ratio of the projected pixel footprint...for each pixel and each polygon ***using the definitions of the polygons in the model space***. The footprint calculation unit...calculates the aspect ratio of the projected pixel footprint...of the pixel...on the polygon...based on the angle of incidence of the polygon...with respect to the eye-point E. The footprint calculation unit...***calculates the projected pixel size*** of the pixel...on the polygon...***using the orientation of the polygon in model space...and the texel size of the texture on the polygon***. (Column 9 line 33 – column 10 line 2)

Therefore, there is no teaching or suggestion from Cosman that a control unit receives an input signal that includes information about a shape of a projection of a pixel on the texture. The texturing unit of Cosman only receives information including ***definition of a polygon*** and ***orientation of the polygon*** in the model space, and ***texel size*** of the texture on the polygon. Cosman does not teach or suggest receiving an input signal that includes information about a shape of a projection of a pixel on the texture.

The Examiner stated that it would have been obvious to combine the RAM and output port from Cosman "to the system of Williams because it would have enable [sic] an image generator to store texture information in a RAM and output the information in a display unit." However, the limitations of claim 67 include "a RAM... for...receiving the set of N footprint texel locations and the footprint level of detail from the control unit, and determining N sets of

texel values...associated with one footprint texel location." Neither Williams nor Cosman teach or suggest this limitation of claim 67.

Cosman states, "image data (representative of polygons and surfaces) stored in an environment memory 62 and texture data [is] stored in texture memory 64" (column 8, lines 47-50). "[G]raphic objects...are defined by polygons 20 that are stored in the environment memory 62" (col. 8 line 67- col. 9 line 2). "[T]exture data for those polygons that are textured is stored in texture memory 64...defined in a MIP map storage arrangement which includes a number of levels of detail" (col. 9 lines 11-14). There is no discussion or suggestion in Cosman that the RAM is "for...receiving the set of N footprint texel locations and the footprint level of detail from the control unit" as required by claim 67. Further, Applicants note that Figure 5 of Cosman shows the RAMs have only outputs to the footprint calculation unit, and cannot be "for...determining N sets of texel values...associated with one footprint texel location" as required by claim 67.

Based on at least the above remarks, Applicants respectfully submit that claim 67 is not obvious over Williams in view of Cosman, and request that claim 67 be allowed.

If an independent claim is nonobvious under 35 U.S.C. 103, then any claim depending therefrom is nonobvious. *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988). Since claims 68-70 depend directly or indirectly from claim 67, Applicants submit that claims 68-70 are allowable for at least the same reasons as claim 67.

Based on the foregoing remarks, Applicants believe that the rejections and objections in the Office Action of February 14, 2003 are fully overcome, and that the Application is in condition for allowance. If the Examiner has questions regarding the case, he is invited to contact Applicants' undersigned representative at the number given below.

Respectfully submitted,

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